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Quality Dimensions for B2C E-Commerce

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Abstract

Organizations have still not realized the full potential of e-commerce. One factor that is likely to influence the further adoption of e-commerce is the quality of the e-commerce system as system quality impacts user satisfaction and hence use of the system. However, in order to improve the quality of any systems, one first needs to identify measures to assess quality. Although other researchers have recognized the need for such measures, they have primarily focused on a single specific aspect of e-commerce systems, typically the user interface. In this paper we identify the key components of e-commerce systems and synthesize existing research related to quality of these components to arrive at a comprehensive list of quality dimensions, which in turn provide measures to assess the quality of e-commerce systems.

Keywords: e-commerce systems, quality dimensions

1. Introduction

The OECD (2002) defines electronic commerce (e-commerce) as the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organizations in which goods and services are ordered over the Internet, even though the payment and the ultimate delivery of the good or service may be conducted on or off-line. E-commerce has the potential to play a pivotal role in many organizations [11] [19]. It can change the way in which organizations interact both with their customers and their suppliers and offers the potential for certain organizations to considerably improve the efficiency and reliability of a number of their business processes [31].

There are different types of e-commerce, the most important for the purposes of this paper are B2C and B2B e-commerce [11] [31]. B2C commerce involves online retailing transactions with individual customers while B2B commerce concerns transactions between business corporations [11]. In this paper, we concentrate on B2C e-commerce systems.

Despite their potential, B2C e-commerce systems have not been as widely accepted as one might expect. For example, Pavlou et al. [25] point out that although B2C commerce has existed for over a decade the uncertainty of the online environment still makes many consumers reluctant to engage in online exchange relationships with sellers. One of the reasons for this may be a lack of quality, where we define quality as "fitness for use" [36] [37] [39] [41]. As with other information systems, organizations can only fully realize the benefits of e-commerce systems if they ensure that their systems display a high level of quality [40]. For example, quality is likely to affect user satisfaction and user satisfaction in turn affects use [7] [8] [13]. Therefore, by focusing on the quality of their systems, e-commerce system developers may increase use and hence help organizations to more fully realize the benefits of e-commerce systems.

However, the level of quality of an e-commerce system can only be assessed if it can be measured, and since quality is a multi-dimensional concept [40] there is a need for a set of quality measures for e-commerce systems. Moreover, as Moody [18] points out, most approaches to quality evaluation decompose quality into lower level characteristics (dimensions) as this makes it easier to measure. These dimensions can further be broken down into sub characteristics which can then be measured by quality metrics, leading to the need for a hierarchy of quality dimensions.

Defining a comprehensive set of quality dimensions for e-commerce systems has many benefits. For example, the list is likely to be of value to academics and practitioners as they try to develop a more thorough understanding of the e-commerce phenomenon [20] [34], as well as to designers, who can use the list as a checklist to identify the quality dimensions that are likely to be relevant to the system under development. Moreover, a well-defined set of quality criteria is likely to improve the sharing of data across organizations, as organizations will be more willing to share data if the quality of that data is known [27]. The latter is especially

important for B2B e-commerce.

The importance of e-commerce system quality has not escaped researchers. For example, a number of researchers identified user interface quality dimensions for e-commerce systems [15] as well as other factors affecting the adoption and acceptance of e-commerce systems [1] [22] [24]. This paper draws on this literature but goes beyond that to look at other information system quality literature. The starting point is that e-commerce systems typically incorporate components that it has in common with other types of systems, such as knowledge management systems, data warehouses, and so on. The quality dimensions defined for these components are therefore also relevant to e-commerce systems and previous work on the quality dimensions of these components can therefore be used to derive a more comprehensive set of quality dimensions for e-commerce systems.

This paper is organized as follows. In Section 2 we derive a generic architecture for B2C e-commerce system and identify a set of components that e-commerce systems share with other information systems. In Section 3 we discuss literature on the quality of the components we identified. In Section 4 we propose and justify a more comprehensive set of quality dimensions that can be used to assess the overall quality of e-commerce systems. Finally, Section 5 concludes the paper.

2. A System Architecture for B2C E-Commerce Systems

As stated in the introduction the two major types of e-commerce are business to business (B2B) and business to consumer (B2C). He et al. [11] focus on the role that agents play in these two types of e-commerce. For the purposes of this paper, we restrict ourselves to the consumer behavior buying model that He et al. [11] develop for B2C e-commerce (see Figure 1). The process starts with the consumer identifying a need (need identification). Based on that need a consumer determines what to buy (product brokering). Once this stage is complete the customer decides who to buy the product from (merchant brokering), a process that this may or may not be preceded by a buyer coalition formation in which buyers try and form a grouping in order to approach the merchant with a larger order, presumably in order to obtain a discount. Once the merchant has been identified, the terms and conditions under which the sale will take place must be negotiated. This is followed by the purchase and delivery phase. In the final stage the product is put into service and evaluated.

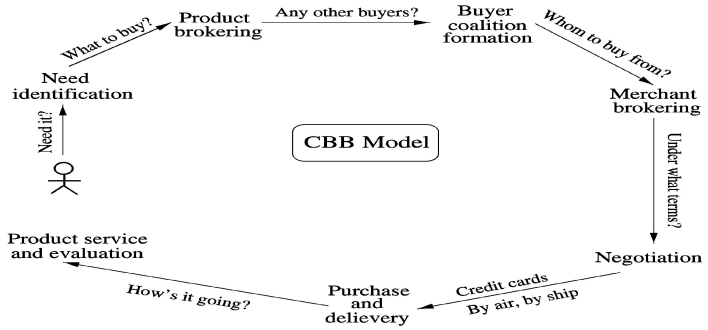

Figure 1. Consumer behavior buying model [11]

We use the model above to help motivate a generic architecture for a B2C e-commerce system (depicted in Figure 2). While the role of most of the components identified in figure 2, and their relationship to He et al's [11] model will be clear, it is useful to draw attention to the agent component. Agents can be used to enhance a number of processes involved in the purchase of a product [19]. For example, during the product brokering phase, agents can be used to perform roles similar to that of a human salesperson (i.e. personalized product recommendation, thus providing a mechanism to overcome information overload incurred when shopping in an Internet marketplace [5], and helping customers decide which products to purchase [28] [29]. Most recommendation systems require the use of analysis techniques (e.g. data mining), and this in turn requires that the analysis agent interface with a set of data and knowledge stores. These stores can be created and maintained both by extracting data and knowledge from sources as well as by storing the transactions that are processed by the e-commerce system. The product and service evaluation phase will also produce data and knowledge that, if stored, could be used to improve the product brokering and merchant brokering phase. Similar benefits may also be gained by using the agent analysis subsystem and data and knowledge stores in the other brokering and negotiation phase(s).

Another component that is worth elaborating on is the ontology, a component that has been identified as critical in e-business applications [9] [17] [19] [21] [26]. An ontology consists of descriptions of the terminology used in a domain and other domain specific information. It establishes a common vocabulary and allows different agents to interact [21], and allow them communicate in a semantic way, exchanging messages which convey information according to explicit domain ontologies [19]. For example, a brokering agent may employ a disambiguation agent that uses the terms in the ontology to assist it in accomplishing its mission. By using standard terminology as defined in the ontology, the brokering agent can identify similar products offered by other companies, even though they may described in different terms than those used by the customer.

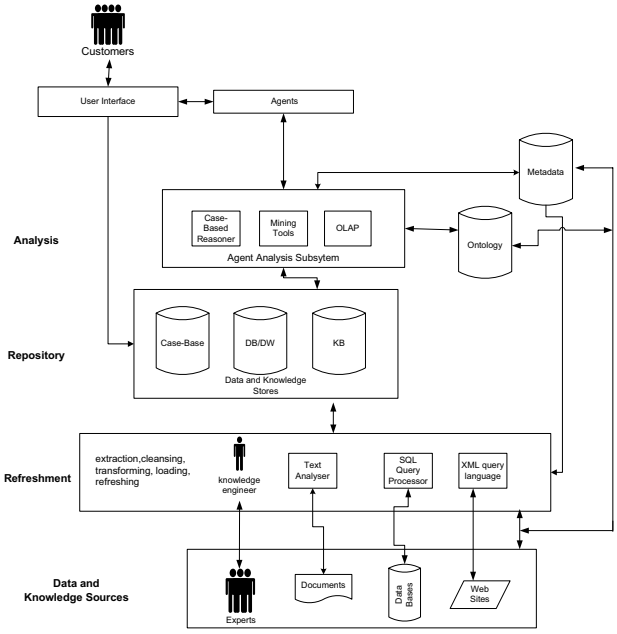

Figure 2. Architecture for an e-commerce system

3. Relevant Literature

As shown in the previous section, e-commerce systems typically encompass a number of components (e.g. data and knowledge Stores, ontologies, user interface). There are definitions of quality dimensions many of these components and these can be used to define quality dimensions for e-commerce systems. However, because of their special nature, there are additional quality-related issues that are peculiar to e-commerce systems. Trust and risk are two important such issues. Moreover, existing theories related to IT acceptance and adoption (e.g. TAM, TPB and Agency Theory) have been used to help explain the reluctance of consumers to engage in e-commerce [1] [22] [23] [24] [25], and can therefore also be used to derive quality dimensions for e-commerce systems.

3.1 Data and Data Warehouse Quality Dimensions

Since data storage and data warehouses are important components of e-commerce systems, quality dimensions related to these are relevant to e-commerce systems as well. Jarke et al. [12] discuss how to extend the data warehouse architecture model to support explicit quality models, and define a set of hierarchically characterized quality dimensions for data warehouses, including design and administration quality dimensions, data usage quality dimensions and data quality dimensions. Design and administration quality is broken down further into schema and data quality and metadata evolution. Schema and data quality include correctness, completeness, minimality, traceability and interpretability. Data usage quality is decomposed into accessibility, which includes availability and security, and usefulness which includes interpretability, responsiveness and timeliness. Timeliness is further broken down into currency and volatility. Data quality includes completeness, credibility, accuracy, consistency and data interpretability.

Other relevant work is the definition of a rigorous set of data quality dimensions that are anchored in ontological foundations [38]. The purpose of these dimensions is to provide guidance to system designers on data quality

issues. Burton-Jones et al. [4] propose a suite of metrics for assessing the quality of ontologies.

3.2 Knowledge Management Systems Quality Dimensions

Rao and Osei-Bryson [26] identify a set of quality dimensions for knowledge management system (KMS) and categorize them as relevant to either the ontology, knowledge items, knowledge retainers (or sources) or the usage of the KMS. Quality dimensions related to ontology include accuracy or correctness, clarity or interpretability, completeness or coverage or comprehensiveness, consistency, infrastructure quality, lawfulness, metadata evolution, minimality, purpose quality, relevance, richness, security quality, strategy quality, traceability. The knowledge item quality dimensions include accuracy, consistency, currency, data interpretability/degree of context, volatility, degree of importance/relevance of knowledge in the system/usage, degree of detail, sharing, and usefulness. Quality dimensions related to knowledge retainers include accuracy, authority/expertise, credibility, consistency, degree of detail, history/reuse/relevance, degree of context, security, accessibility, willingness to share, sharing, usefulness, and degree of socialization. Finally, the dimensions related to usage include accessibility, availability, completeness/coverage, ease of use, integration quality, interpretability, level of sharing, quantity of new knowledge generated, relevance, responsiveness/efficiency and security (access rights).

3.3 Interface Quality

Palmer [20] identifies key metrics for identifying elements of successful web site design. He concludes that download delay (speed of access and display rate), navigation (organization, arrangement, layout and sequencing), content (amount and variety of product information), interactivity (customization and interactivity) and responsiveness (feedback options and FAQs) all contribute to web site success. Pavlou and Fygenson [24] add information protection to this list of technological characteristics but argue that consumer skills, time and monetary resources, and product characteristics (product diagnosticity and product value) also influence e-commerce adoption.

Kim et al. [15] argue that existing data quality approaches have focused on the content of the information (e.g. relevance, accuracy, and completeness) and have not addressed interface-related aspects of information presentation and end-user delivery, an important issue for e-commerce systems. More specifically, as it relates to presentation and delivery, some of the core aspects (e.g. the usability challenges of disorientation, irrelevant information, and cognitive overhead in e-commerce systems) have not been addressed. Kim et al. [15] propose an E-Quality (EQ) framework for e-business that addresses the three problems of disorientation, irrelevant information and cognitive overhead. This data quality framework incorporates three quality dimensions each consisting of three quality constructs, namely information content, which consists of information accuracy, information relevance and information completeness, form, which consists of interface structural quality, information packaging quality and information accessibility, and time, which consists of history maintenance quality, information delivery quality and information currency.

3.4 Risk and Trust

Risk and trust significantly affect the adoption of e-commerce [14] [22] [23] [24] [32]. Trust can be defined as a quantified belief by a trustor with respect to the competence, honesty, security and dependability of a trustee within a specified context [10], while risk can be defined as a probability of a failure with respect to the context of the interaction (e.g. nonpayment for service, a security failure or service failure) [10]. In general, higher risk implies less trust.

Jones et al. [14] argue that the full benefit of e-commerce can only be realized if trust develops between the various stakeholders (businesses, consumer, etc.). However, they point out that the new context of e-business calls for a new understanding of trust and the factors that lead to the establishment of trust. For e-commerce systems trust is no longer just an issue of dependability as was traditionally the case (i.e. safe, reliable, available and secure). Businesses and consumers may consider the system to be completely dependable in terms of the traditional dimensions yet may still not trust the system with their business or personal interests unless there is some legal framework they can call on. Additionally, businesses now need to trust not just their own systems but also those of their partners and the infrastructures used for establishing their communication. Jones et al. [14] group these requirements for trust into those relating to ensuring the identity and reliability of e-business stakeholders (stakeholders); those concerning the quality and protection of digital assets (information); and those about the dependability of services and systems (infrastructure).

So and Sculli [32] list a number of trust-related issues that arise in the context of e-commerce and mobile commerce, including: privacy and security on the web, online customer service quality, product delivery and the return of online purchases. Sztompka [35] propose three dimensions for the evaluation of trustworthiness, namely reputation, performance and appearance (sometimes referred to as image).

3.4 Relevant Theories

A number of studies have sought to explain the acceptance and adoption of e-commerce through the use of a number of existing technology adoption theories. Thus, Pavlou [22] seeks to predict consumer acceptance of e-commerce by combining the constructs of trust and risk with those of the technology acceptance model (TAM) [6]. The motivation for this study is the assumption that once there is uncertainty, as is common in e-commerce, trust and risk will play an important role in the technology's acceptance. Pavlou [22] argues that the lack of trust in e-commerce is one of the main reasons why it has not been more widely accepted. The uncertainty of using a global open infrastructure coupled with the distant and impersonal nature of the on-line environment makes risk a relevant factor in e-commerce acceptance. Creating trust in e-commerce will reduce the uncertainty and risk associated with the possible opportunistic behaviour of a Web retailer. Pavlou and Dimoka [23] propose the use of social networks to build trust between the buyer and seller and to overcome the uncertainty caused by the impersonal and distant nature of digital auction marketplaces.

Pavlou and Fygenson [24] extend the theory of planned behaviour (TPB) to explain and predict the adoption of e-commerce by consumers, focussing specifically on how customers get information from the Web vendors and purchase products. They state that not only are trust and technology adoption variables (perceived usefulness and ease of use) important as salient beliefs for predicting e-commerce adoption but also that technological characteristics (download delay, Website navigability, and information protection), consumer skills, time and monetary resources, and product characteristics (product diagnosticity and product value) add explanatory and predictive power. Pavlou et al. [25] extend the agency theory and use it to better understand the nature of uncertainty. These findings can then be used to reduce uncertainty and increase B2C e-commerce adoption.

Ahn et al. [1] investigate the effect of playfulness on user acceptance of online retailing and tested the relationship between Web quality factors and user acceptance behaviour. Their justification for studying playfulness is that customers obtain pleasure in using the system as well as in purchasing the needed product. The results show that playfulness plays an important role in enhancing user attitude and behavioral intention to use a site. Web quality, which is categorized into system quality (e.g. interface design, functionality, response time, etc.), information quality (e.g. data format, completeness and timeliness), and service quality (i.e. how well a delivered service level matches customer expectations) has a significant impact on the perceived ease of use, playfulness, and usefulness, and consequently, that it encourages website use in the context of online retailing.

4. Model of E-commerce Systems Quality

Based on the generic architecture of an e-commerce system introduced in section 2 and the subsequent discussion of the existing quality literature section 3, we derive a comprehensive set of quality dimensions for e-business systems.

It is important to point out that a number of the quality dimensions in the existing literature overlap, even as authors may use differ terms. For example, Kim et al. [15] define information currency as the temporal accuracy of information content and links on Web pages. This is similar to currency as defined by Jarke et al. [12] and Rao and Osei-Bryson [26]. On the other hand, different authors often use the same term to refer to different concepts. For example, Rao and Osei-Bryson [26] define availability as the availability of the knowledge in the system, while Jarke et al. [12] define availability as the percentage of time the source or data warehouse system is available. The latter definition more closely resembles the Kim et al. [15] concept of completeness, defined as the availability as needed of the information content and hyperlinks within Web pages for users to complete specific tasks in an effective manner.

We have attempted to resolve this ambiguity of terms by synthesizing the literature to derive a comprehensive list of dimensions for e-commerce quality and have provided the justification for this classification (i.e. the literature that supports these dimensions). The quality dimensions will be discussed from the perspective of the agents embedded in the system, the customer and other users.

4.1 Agent

In order to fulfil their roles, agents in e-commerce systems rely on the data and knowledge stored in the system, the ontology and the metadata (see Figure 2). The quality of an agent thus is dependent on the quality of these entities, and we can use quality dimensions defined in the literature for each of these components to formulate quality dimensions for agents in e-commerce systems.

4.1.1 Ontology-Related Quality Dimensions

An ontology has been recognized as an important component of e-commerce systems. The following ontology-related quality dimensions can be used for e-commerce systems.

- *Accuracy/correctness*: The extent to which the ontology reflects the real world domain, i.e. the number of conflicts with real world domain.
- *Authority*: The reusability of the ontology for other applications. This would be applicable in cases where ontologies of different organizations may need to be combined or merged.
- *Clarity/interpretability*: The clarity of the context of the concepts and relationships. This is extremely important since the user will be browsing the ontology.
- *Completeness/coverage/comprehensiveness*: The extent to which the ontology covers the concepts, the relationships and business rules in the domain.
- *Consistency*: The consistency of the meaning of concepts, relationships and business rules used in the ontology.
- *History*: The longevity of the ontology.
- *Knowledge sharing quality*: The extent to which knowledge is shared by different user groups (communities of practice). The ontology can be seen as a way of standardizing the knowledge.
- *Lawfulness*: In order to automate the search process the ontology and knowledge stores must be represented in a format that supports automation.
- *Metadata evolution*: The evolution of the ontology. It is expected that the ontology will change. If it is understood why/how these changes occurred it will provide further context.
- *Minimality*: The number of concepts or relationships representing the same thing.
- *Purpose quality*: The ability of the ontology to convey the purpose of the organization.
- *Relevance*: The relevance of the concepts and relationships to at least one knowledge task for the given organization and/or industry.
- *Richness*: The breadth of concepts/terms used.
- *Security quality*: The ability of the system to protect the critical knowledge (e.g. infrastructural, cultural, strategy knowledge) stored in the ontology.
- *Strategy quality*: The extent to which the ontology reflects the strategy of the organization.
- *Traceability*: The reasons for the design of the ontology and the changes made to it.

4.1.2 Quality Dimensions Related to Knowledge Items

Agents access and create knowledge which will be stored as knowledge items in the system. We therefore apply the following dimensions for knowledge item quality.

- *Accuracy*: The accuracy of the knowledge extraction process and the knowledge items.
- *Consistency*: The level of consistency of the knowledge items in the system, both from different sources, and between knowledge items extracted from a source and the business rules.
- *Currency*: When the knowledge item was discovered by the knowledge retainer and verified to be accurate.
- *Data interpretability/Degree of context*: The number of interpretable knowledge items. The more context provided for a knowledge item the more it can be reused and the more value it has.
- *Degree of detail*: The deeper or broader the knowledge the higher the quality.
- *Degree of importance/relevance/usage*: What the knowledge item is used for. Some knowledge is more important to an organization depending on the significance of the task it is used for.
- *Sharing*: The diversity of user groups that access a given knowledge item.
- *Usefulness*: The usefulness in new knowledge creation. If a knowledge item is used in the creation of a number of different types of knowledge then it is likely to be of high quality.
- *Volatility*: The time period for which the knowledge is valid.

4.1.3 Quality Dimensions Related to Knowledge Retainers

Knowledge items are stored in knowledge retainers. We can therefore rely on the identification of a set of quality dimensions for knowledge retainers.

- *Accuracy:* The accuracy of the knowledge retainer.
- *Authority/Expertise:* The level of expertise of the retainer, and hence the credibility. A retainer may have different levels of authority for different concepts.
- *Consistency:* The consistency of knowledge across retainers.
- *Credibility:* The credibility of the retainer.
- *Degree of detail:* A retainer may have knowledge about a number of concepts or it may have detailed knowledge about a particular concept.
- *History/reuse/relevance:* The usage or relevance of the retainer.
- *Sharing:* The diversity of user groups that access a retainer.
- *Usefulness:* The usefulness in new knowledge creation. If a retainer is used frequently in the creation of knowledge then it could be seen as being of a high quality.

While the above apply to all knowledge containers, there are additional dimensions that only apply to some, depending on whether the knowledge retainer contains codified or personalized knowledge [30]. Codified knowledge refers to knowledge that is stored in explicit form, while personalized knowledge is knowledge of the people within an organization. The following dimensions pertain to retainers of codified knowledge.

- *Degree of context*: The reasons for the creation of the knowledge retainer. The more context that is provided for a knowledge retainer the more it can be reused and the more value it has.
- *Security*: Preventing unauthorized access to knowledge in a retainer.

The following concerns retainers of personalized knowledge

- *Accessibility*: The accessibility of the retainer. Humans can be inaccessible for a number of reasons e.g. sick, holiday, unwillingness.
- *Degree of socialization*: The level of socialization of the person.
- *Security*: Preventing persons from disclosing critical knowledge of the organization.
- *Willingness to share*: The extent to which experts are willing to share their knowledge.

4.1.4 Schema-Related Quality Dimensions

Agents access databases or warehouses to help in their processing (e.g. data mining) [3] [16]. Each database or data warehouse will have a set of schemata and there are schema-related quality dimensions [12], including the following.

- *Correctness*: Number of conflicts to other models/real world.
- *Completeness*: Level of coverage, number of represented business rules.
- *Minimality*: Number of redundant entities/relationships in a model.
- *Traceability*: The extent to which the designer's requirements and changes are recorded.
- *Interpretability*: Quality of documentation.

4.1.5 Data-Related Quality Dimensions

As the agents access data bases, their quality will be influenced by the quality of the data in the data bases. Therefore, data-related quality dimensions are relevant here as well.

- *Completeness*: The percentage of the real-world information entered in the sources and/or the warehouse.
- *Credibility*: The credibility of the source that provided the information.
- *Accuracy*: The accuracy of the data entry process which happened at the sources.
- *Consistency*: The logical coherence of the information.
- *Data Interpretability*: Data description i.e. number of tuples with interpretable data.

4.1.6 Quality Dimensions Related to Metadata Evolution

The use of data warehouses, databases and knowledge bases produces metadata that if stored can provide valuable insights for administrators. Therefore this should be considered when considering quality [12].

4.2 Customer

In addition to agent-related quality dimensions, there are a number of customer-related quality dimensions. Some of these dimensions are related to the technical details of the system (e.g. download delay), some are related to the usage of the system (e.g. ease of use, playfulness) and some are related to social issues (e.g. risk and trust). The dimensions and the literature support for these dimensions related to customers are specified below.

- *Trust.*
- *Risk.*
- *Satisfaction:* The quality of the product or service is directly linked to satisfaction [32].
- *Value*: The ratio or tradeoff between quality and price [32].
- *Perceived Usefulness (PU*): The degree to which a person believes that using a particular system would enhance his/her job performance [6].
- *Ease of Use (EOU):* The degree to which a person feels that using a particular system would be free of effort [6].
- *Perceived behavioral control (PBC):* People's perceptions of their ability to perform a given behavior [2].
- *Playfulness:* The belief that interacting would result in enjoyment [1].
- *Accuracy:* Freedom from mistakes in the information content and hyperlinks provided within Web pages [15].
- *Relevance:* Pertinence to users' interests of the information/knowledge content and hyperlinks provided within Web pages based on a query. [15] [26].
- *Completeness:* Availability of the information content and hyperlinks for users to complete specific tasks in an effective manner [1] [15] [26].
- *Availability*: The percentage of time the system is available [12] [26]. Jones et al. [14] refer to this as reliability.
- *Interpretability:* How effectively a variety of information in various media types is packaged within the Web interface for presentation to end users [12] [26]. Similar to what Kim et al. [15] termed information packaging quality and Ahn et al. [1] termed data format.
- *Privacy and Security:* [12] [14] [24] [26]. Jones et al. [14] break down security into: authentication, confidentiality, non-repudiation, integrity. This has been categorized as dependability [14]. Pavlou and Fygenson [24] address this when they consider information protection under technological characteristics.
- *Timeliness:* The temporal accuracy of information/knowledge (content and links). Captures the notion of age of information/knowledge which can be measured by the amount of time that has passed since it was last updated [12] [15] [1]. Kim et al. [15] have categorized this as information currency. Jarke et al. [12] have broken this down into currency and volatility.
- *Responsiveness:* The ease and efficiency with which a user can access and retrieve desired information [12] [25] [1] [26]. Similar to what Kim et al. [15] have termed information accessibility. Pavlou and Fygenson [24] have discussed this under technological characteristics (e.g. download delay, navigability).
- *Interface Structural Quality:* Primarily comprises interface consistency and structural awareness. Interface consistency implies consistency in the structural arrangement and style of information content and hyperlinks within an e-business application. Structural awareness implies that the interface makes the user aware of the larger structure of the information content in the Web pages in the e-business application [15] [1].
- *History Maintenance Quality:* The flexibility and comprehensiveness of features that an e-business application provides to its users for specifying and maintaining history of user actions and data and system states of the application [15]. Similar to metadata quality [12].
- *Information Delivery Quality:* The flexibility and comprehensiveness of features that an e-business application provides to its users for specifying and controlling the temporal relationships among the various hypermedia components for effective delivery of integrated hypermedia information to users [15].
- *Integration quality:* The ease with which information/knowledge can be added to the system [26].
- *Safety:* Non-occurrence of catastrophic events that threaten human life, health and the environment (e.g. virtual hospital) [14].

4.3 Other Roles

Apart from the customer there are a number of other types of primarily technical users who have an interest in the quality of the e-commerce system. Since each of these types of user focuses on certain components of the

system, the quality dimensions derived from those components are most directly relevant to them. Thus, the system administrator focuses essentially on all the components of an e-commerce system, including the data and knowledge stores, metadata, the ontology, the agent, querying tools and the overall system. The quality issues relevant to system administrators therefore include data and knowledge quality, system availability and responsiveness, metadata availability, ontology security, and refreshment efficiency, among others. The system designer is primarily concerned with the data stores and source schemas, the knowledge stores, metadata associated with each and the software that drives the various agents. The quality issues relevant to this role are therefore those that are related to schemas, knowledge retainers, metadata, ontology and those related to agents. Application programmers write the code for various components in the system. As such, they are primarily concerned with the software that drives agents and metadata. The primary quality issues of concern to this role therefore include those relevant to agents and metadata. Finally, the data source administrators are responsible for the data and knowledge sources in the e-commerce system. Their major quality related concern therefore is system availability.

5. Conclusions and Future Work

This paper provides a comprehensive set of dimensions for assessing the quality of e-business systems. Although recent research has began to recognise the need for a comprehensive list of quality dimensions for e-commerce systems [33] the majority of research has addressed quality issues for specific aspects of e-commerce systems (e.g. user interface). Identifying this comprehensive set of dimensions will allow practitioners and researchers to more fully understand the e-commerce phenomena and, if addressed, will help realize the net benefits that these systems can provide.

Not all the dimensions identified in this paper are applicable to all e-commerce systems. For example, e-commerce systems that do not recommend related products to customers probably may not need to include a data mining component and data warehouse related quality criteria may therefore not be relevant. Therefore, depending on the components that are included the designer can identify which dimensions should be considered. The dimensions proposed in this paper therefore constitute a checklist for designers. In future work we intend to validate these dimensions by using them to evaluate existing e-commerce systems.

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